The Pan-Pacific Entomologist

VOL. XIII, No. 3 July, 1937

A REPRESENTATIVE OF AN OLD WORLD SUBFAMILY OF ACRIDIDAE IN SOUTH-WESTERN NORTH AMERICA

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In 1889 L. Bruner described a curious Acridid from Lower California which he called *Dracotettix monstrosus* and placed into the subfamily Pyrgomorphinæ (Proc. U. S. Nat. Mus., XII, 1889, p. 49). Later on, he removed the genus, while describing two more species of it, again from California, to the subfamily Catantopinæ, in the vicinity of *Tropinotus* (Biologia Centrali-Americana, Acrid., p. 226, 1907). This position of the genus appeared to satisfy other American orthopterists.

Having had a recent occasion to examine a pair of specimens of *Dracotettix monstrosus*, I was immediately struck by the great resemblance of the insect to members of the subfamily Pamphaginæ, hitherto known only from the Old World. A more detailed study confirmed the correctness of this impression, supported by the following morphological data.

The structure of antennæ in *Dracotettix*, while not impossible for a member of Catantopinæ, is certainly such as is very common amongst genera of Pamphaginæ with moderately specialized antennæ. In *Dracotettix* they are fairly stoutly built, and the basal joints are distinctly incrassate, thus exhibiting a tendency to a differentiation into ensiculus and flagellum of the more highly specialized Pamphaginæ.

The frontal ridge of *Dracotettix* is of a type very characteristic for Pamphaginæ, though similar structure of the ridge can be observed in certain genera of Catantopinæ. It is, however, the structure of the fastigium of vertex which proves beyond any doubt the Pamphagine affinity of *Dracotettix*. The fastigium is oval in shape, strongly concave, with acute raised margins which tend to bifurcate near the eyes, although becoming less distinct posteriorly. The bifurcated fastigial margins are amongst the essential characters of the subfamily Pamphaginæ and the degree of their development in *Dracotettix* is exactly the same as in *Lamarckiana*, one of the most typical genera of that sub-

family. It is interesting to note that *Dracotettix* shares with *Lamarckiana* another detail in the structure of the fastigium, namely, the absence of an apical median sulcus which is well developed in many other genera of Pamphaginæ, but not in all of them. Its absence in *Dracotettix*, therefore, cannot be used as an argument against including the genus into Pamphaginæ.

The structure of pronotum in *Dracotettix* appears very different from that in all known Old World Pamphaginæ, because of the strongly developed lateral carinæ, while the median carina and the transverse sulci are of the type to be expected in the subfamily. However, a tendency to the development of lateral pronotal carinæ can be observed in many genera of Pamphaginæ, not closely related to each other, such as *Ocneridia* (e.g. *canonica* Fisch.), *Euryparyphes*, *Nocarodes*, *Adephagus*, and especially *Akicera*. In the last named genus, the lateral carinæ are developed particularly well, and it is interesting to note that the general shape of the median carina in *Dracotettix* is also very similar to that in *Akicera*.

Apparently, the reason for including *Dracotettix* into Catantopinæ was the presence of a prominent prosternal tubercle. I had already an opportunity to point out (Ann. & Mag. Nat. Hist., ser. 10, vol. XIV, 1934, p. 469) that this character has no absolute value, and the tubercle may be well developed, or almost absent, in species of Catantopinæ belonging to the same genus (e.g. *Dericorys*). On the other hand, the tubercle is well developed in many Pamphaginæ, but always arising from the anterior margin of the prosternum, not from its disc. The tubercle in *Dracotettix* is exactly of this type characteristic for Pamphaginæ, since it is flattened in front and with the anterior edges formed by the prolongation of the anterior margin of prosternum, while its posterior surface is sloping and rugose. On this character alone, *Dracotettix* should be referred to Pamphaginæ without any hesitation.

There is, however, a further highly important character supporting my view, although its presence in Pamphaginæ has been underestimated by previous workers. I refer to the specialized (rugulose, or striate) plate at the antero-inferior angle of the second abdominal tergite. Such a plate is a well-known character of the group Batrachotetrigini (*Eremobiites* of Saussure,

who also mentioned its presence in Pamphaginæ) of the subfamily Oedipodinæ, but my examination of a large number of genera of Pamphaginæ proved that it is not only present in many of them, but often more highly developed than in Batrachotetrigini. Thus, the plate is very distinct and provided with dense parallel ridges in *Lamarckiana, Porthetis, Hololopha, Eunapiodes, Ocnerodes, Akicera, Pamphagus,* while in *Acinipe, Amigus* and *Euryparyphes* the plate is distinct, but only granulate, not ridged. No plate, or only a very rudimentary one is observed in *Ocneridia, Tropidauchen, Nocaracris, Nocarodes, Glauia, Orchamus, Prionosthenus* and *Pamphagulus.* If, therefore, the absence of this plate cannot be regarded as a character excluding a genus from Pamphaginæ, its presence in well developed form in *Dracotettix* constitutes a very strong argument in favor of including this genus into that subfamily, or into the group Batrachotetrigini. The structure of the vertex in our genus is, however, definitely against the latter possibility.

If still further arguments are needed, the shape of posterior femur and the irregular disposition of the pinnate ridges on its externomedian area in *Dracotettix* are such as are usual for Pamphaginæ, but not for Catantopinæ. The armature of posterior tibia is also as in Pamphaginæ.

Finally, the male abdomen of *Dracotettix* is recurved towards the apex which is compressed laterally, with the subgenital plate truncate and tuberculate, as in many Pamphaginæ, but very unlike the various types of abdomen observed in Catantopinæ.

It would be superfluous to quote further minor points in support of my firm conviction that *Dracotettix* represents a genus of Pamphaginæ. Unfortunately, I have no specimens of another Californian genus *Leptoscirtus* L. Bruner, considered by American authors closely allied to *Dracotettix,* which therefore, for the time being remains the sole representative in the New World of the essentially Old World subfamily Pamphaginæ.

The distribution of Pamphaginæ is of unusual interest, as will be seen from the appended map (fig. 1). Its representatives occur mostly in dry rocky regions of South and East Africa, North-West Africa, Iberian peninsula, Western Asia and in the Canary Islands. This type of distribution is, however, not exceptional and numerous parallel cases can be quoted. For instance,

a very aberrant group Orgeriini of the family Dictyopharidæ (Homoptera) includes a considerable number of genera spread over drier parts of the Mediterranean region and into Turkestan, several genera occurring in South Africa, and has representatives in south-western North America. It is particularly significant that the genus *Orgerius* includes about 20 Mediterranean species and at least four occurring in California, Colorado and Utah (Oshanin, Revue Russe d'Entom., XIII, 1913, p. 135; Melichar, Abh.k.k. zool.-bot.Ges.Wien, VII, Heft 1, 1912). In the Neuropterous family Bittacidæ there are two allied flightless genera, *Apterobittacus* MacLach. occurring in California, and *Anomalobittacus* Kimmins of South Africa (Kimmins, Ann. & Mag. Nat. Hist., ser. 10, I, 1928, p. 395; Wood, *l.c.*, ser. 10, XII, 1933, p. 536). A type of distribution very similar to that outlined for Pamphaginæ is observed, amongst plants, in the case of the genus *Fagonia* of the order Zygophyllaceæ (Popov, Bull. Middle Asian State Univ. 15 1927, p. 248).

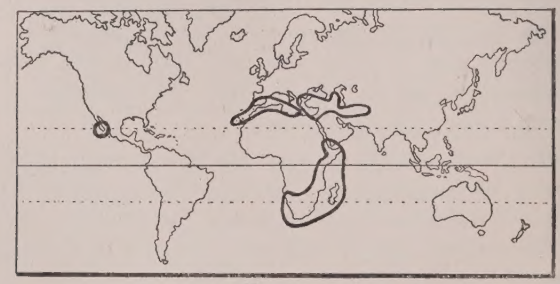

Figure 1

It may remain a matter of opinion whether discontinuous distribution of this type should be regarded as giving support to the former existence of an Atlantis, or to Wegener's theory of continental drift. In any case, there is a series of definitely established facts of an ancient faunistic and floristic relationship between the dry semi-desert and desert countries of the Mediterranean region and South Africa, on one hand, and arid south-western North America, on the other.

I am very grateful to my friends, Mr. W. E. China and Mr. D. E. Kimmins, for reference to the literature on their special groups of insects.

A NEW GENUS AND SPECIES OF STREPSIPTERA FROM CANADA

BY RICHARD M. BOHART

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A good series of specimens of both sexes of a remarkable strepsipterous insect of the family Halictophagidæ has been sent the author by Miss Margaret Mackay of the University of Saskatchewan. The material was collected by her at Vonda, Saskatchewan, parasitic on leafhoppers of the genus *Deltocephalus*. On the basis of wing venation, thoracic structure, genitalia, and particularly the peculiar tibiæ of this insect, it has been deemed advisable to erect for it a new genus, *Pseudopatella*.

At first glance the legs of the male of this form appear to have an extra segment interpolated between the femur and tibia corresponding to the patella as found in most Arachnida. However, as closer examination reveals no articulation between the apparent segment and the tibia proper, the indication is that the tibia has undergone a basal differentiation. This character is most pronounced in the forelegs, where the "patella" bears a stout, sharp, sclerotized lateral projection (figs. 1, 3, and 5). This condition is unique among the Halictophagidæ, to which *Pseudopatella* obviously belongs, by virtue of its seven-segmented antennæ and three-segmented tarsi.

For the present the use to which the projection on the front legs is put can only be a matter for conjecture. It appears feasible, however, that it might assist the male in emerging from his puparium. The author has had the opportunity of observing at various times the emergence of several male Strepsiptera from their puparia in wasps and bees. In these forms the male pops off the head or cap of the puparium by pushing against it with its mandibles. It then works its way out with more or less of a wriggling motion, poises for an instant on the edge of the puparium as it unfolds its wings, and flies off. Occasionally the male experiences difficulty in emerging and the author has caught specimens of bees and wasps bearing males dead within their headless puparia. Apparently they had been unable to emerge even after thrusting off the puparium cap.

A projection on the forelegs which could be hooked over the edge of the puparium, thereby increasing the leverage, would obviously be useful during emergence. In *Pseudopatella* this would be especially true as the puparium cap is not completely dehiscent but is connected by a broad ventral hinge with the rest of the puparium (fig. 2), and may likely interfere with emergence.

Other features of *Pseudopatella* in addition to the legs distinguish it in the male from related halictophagid genera. The antennæ are less compact than those of *Pentozoe* Pierce, *Cyrtacaraxenos* Pierce, or *Pyrilloxenos* Pierce, but are similar to these in that the segmental prolongations become progressively shorter toward the apex. The second segment of the palpus is slightly longer than the first but is not pointed or strongly tapering as in *Pyrilloxenos, Delphacixenos* Pierce, and *Pentacladocera* Pierce. The prothorax is not sunken into the head as in *Pentozoe* and *Stenocranophilus* Pierce and the general relationship of head, pro- and meso-thorax is similar to that of *Pyrilloxenos*. The venation of the hind wings is typical of the more primitive halictophagids, the anal area possessing three veins. The general proportions of the dorsum of the metathorax are most closely parallelled by *Pentozoe* which, however, has a relatively larger prescutum. The ædeagus is more inflated at the base than in *Pentozocera* Pierce or *Cyrtacaraxenos* and more slender than in *Pyrilloxenos*.

The characters of female Strepsiptera parasitic on the Homoptera are so little known that an attempt to ally this form in the female is impossible. The same can be said of first larvæ, the figures and descriptions of which have never been entirely satisfactory. The first larva of *Pseudopatella* has five ocelli in each eye, of which the anterior two are directed forward and are sometimes difficult to distinguish. Never more than four and usually only three ocelli have been shown in the figures of previous workers in this family.

Pseudopatella Bohart, new genus

(Figs. 1-8)

Male. Antennæ seven-segmented with the last five segments laterally produced; segment four with a large basal sensorium. Eyes with fewer and larger facets below than above. Prothorax

and mesothorax not crowded toward the head. Hind wings with three anal veins. Tibiæ basally differentiated, front tibia with a sharp lateral prolongation at the base; tarsi three-segmented, segments nearly equal in size. Metaprescutum small, nearly triangular; postlumbium almost half as long as wide. Ædeagus slender, inflated at the base.

Female. Mandibles with a large apical tooth and sometimes with a very small outer subapical tooth visible. Abdomen apparently five-segmented; first ventral segment with an irregular median darkened area; three transverse median genital openings present on segments two, three, and four, respectively.

First stage larva. Body composed of head, three thoracic, and ten abdominal segments. Eyes with five ocelli. Thoracic segments with two pairs of latero-dorsal bristles each. Tibiæ each with a bristle above the middle. Tarsi similar and spatulate. Ninth abdominal segment latero-dorsally with a pair of short bristles, latero-ventrally with a pair of short tubercles bearing long bristles, and with a single apical bristle in the median ventral line. Tenth abdominal segment with a long pair of latero-dorsal bristles and the usual pair of terminal stylets.

Pseudopatella mackayi Bohart, new species

(Figs. 1-8)

Male. Body dark brown, hind wings and tarsi pale, second and third abdominal segments each with a pair of dark ventral spots, fourth to eighth abdominal segments each with single large median ventral patches. Head wide V-shaped in dorsal aspect, tapering toward the front; mandibles long-triangular and sharply pointed; maxillæ composed of two nearly equal segments, the slightly longer second segment stout, rounded at the tip, and covered with sensoria; antennæ with the prolongations of the third to seventh segments becoming progressively shorter toward the apex, segments not closely compressed. Prothorax band-like, not sunken into the head. Mesothorax transverse, composed of two dorsal parts, the anterior of which bears the slender paddle-shaped elytra. Metaprescutum small, almost triangular; each scutum divided into an upper and a lower section by an oblique line; scutellum broad, five-cornered; postlumbium relatively large, depressed, postcutellum evenly rounded, half the length of the entire metathorax. Legs slender; tibia of front leg about twice as long as its basal projection; hind femora slender, arcuate. Abdomen somewhat depressed dorsally; ædeagus moderately inflated at the base, very slender toward the apex, apical process sharply pointed, forming an acute angle with the main axis. Length of body excluding the antennæ, 1.15 mm.; length of the antennæ, 0.32 mm.; width of the head, 0.39 mm.; wing expanse, 2.15 mm.

Female. Head yellowish-brown except for the mandibles and apical lobe which are dark brown, thorax very dark brown, abdomen with an irregular patch on the first ventral segment which is brown with a yellowish-brown border and similar in size and shape to the outline of the cephalothorax. Shape of the cephalothorax irregular and angled, strengthened dorsally by rod-like thickenings which pass from the base of the thorax to the posterior portion of the head. Mandibles bent sharply outward near the apex, apical tooth sharp. Base of head with a strong, dark-colored thickening on either side reaching from the edges of the brood passage opening almost to the hind angles of the head. Spiracles not reaching the margins, less than their diameter from the hind angles of the head. Width of the cephalothorax at the spiracles, 0.22 mm.; width at base of mandibles, 0.14 mm.; width at base of head, 0.24 mm.; width at base of cephalothorax, 0.18 mm.; length from brood canal opening to apex, 0.09 mm.; length from base of cephalothorax to apex, 0.22 mm.

First stage larva. Length of body excluding stylets, 0.175 mm.; length of stylets, 0.065 mm.

Holotype male, allotype female, and eighteen paratypes (four males and fourteen females). All type material collected at Vonda, Saskatchewan, Canada.

Host: *Deltocephalus affinis* G. and B. (det. by E. P. Van Duzee).

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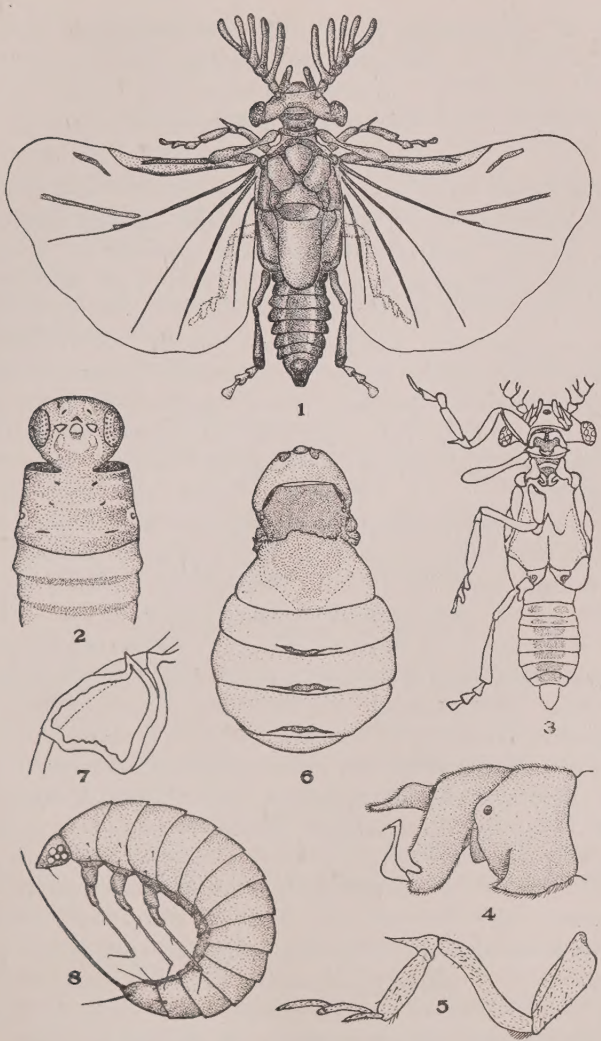

Explanation of Plate. *Pseudopatella mackayi* Bohart. Fig. 1, holotype male, dorsal; Fig. 2, empty male puparium, ventral; Fig. 3, male, ventral; Fig. 4, end of male abdomen, lateral; Fig. 5, prothoracic leg enlarged; Fig. 6, allotype female, ventral (egg sac removed); Fig. 7, female mandible enlarged; Fig. 8, first stage larva, lateral.

STUDIES IN THE GENUS HISTER
(Coleoptera, Histeridæ)

BY EDWARD S. ROSS
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Subgenus SPILODISCUS Lewis

The Pacific Coast species of the *militaris* section of this subgenus, *militaris* Horn, *oregonus* Csy., *electus* Csy. and *simplicipes* Fall, are very closely allied if indeed they be distinct. The last originally described as a rather isolated species and later placed as a variety of *oregonus* was characterized by having the pro-tibiæ non-denticulate along the outer margins. *Oregonus* was separated from *electus* by its more coarsely sculptured elytral flanks, almost non-denticulate fore-tibiæ, narrower form, finer pygidial punctuation and several other characters; *electus* being distinguished from *militaris* by its greater number of pro-tibial denticules.

In an attempt to determine the validity of some of these characters I have brought together as large a series of material relating to these species as I could. Most of this material, in addition to my own, was contained in the collections of Doctors E. C. Van Dyke and F. E. Blaisdell, Mr. J. O. Martin and Mr. L. S. Slevin, deposited in the Museum of the California Academy of Sciences. Unfortunately no specimens were available from Oregon or Washington from which states *oregonus* and *electus* were described; however the series contains representatives from many localities in California, from Lassen County in the north, south to San Diego. In spite of this wide range I have concluded that only one species is represented; that being *militaris*.

For the purpose of determining sex the genitalia of all the specimens were dissected out. A rather interesting correlation of characters was thus discovered; it was found that in every case regardless of distribution, the males possessed the non-denticulate fore-tibiæ characterizing *simplicipes* while only the females had the "normal" denticulate tibiæ. In addition the males were found to be on the whole smaller and more narrow with their pygidia distinctly more weakly punctate; otherwise further secondary sexual characters were not apparent. The striation of the pronotum and elytra showed no peculiarities correlating with sex but exhibited sufficient variability to exclude such characters from use in separating these species.

From these observations it is at once apparent that the form described as *simplicipes* is merely the male of *militaris*, also that the characters used for separating *oregonus* from *electus* seem to be secondary sexual in nature; the former undoubtedly being described from a male and the latter from a female. I cannot find in checking specimens of *militaris* with the descriptions of *electus* and *oregonus* any differences other than those subject to variation. However, except for *simplicipes*, the possible synonomy suggested above must not be regarded as conclusive until specimens from Oregon and Washington are available for examination.

Three specimens in this series from Laguna Beach, Calif., representing both sexes are totally black showing no indication of the usual red and black coloration of the elytra. This is not due to the decolorization of the red by exudation of grease as the specimens are perfectly clean and dry. This peculiarity also noted by Fall (1901), indicates that the red and black coloration of the elytra cannot be used as a general characteristic of this section as supposed by some workers.

Hister s. str. Group SEXSTRIATUS

This group, originally containing the one species *sexstriatus* Lec. (1851) from San Francisco, Calif., has since been enlarged by the addition of *maritimus* Csy. (1916) also from San Francisco and *jacobianus* Csy. (1916) from San Diego. The last was separated from the two northern species by the strong transverse frontal stria of the head which is weaker and inflexed in *sexstriatus* and interrupted medially in *maritimus*. The size and form of the species were also used as characters for their separation by Casey.

In examining over sixty specimens of this group from San Francisco and vicinity I find that the characters used for separating *maritimus* from *sexstriatus* are subject to considerable variation. The frontal stria on one hand may be entire, strong and only slightly inflexed while on the other represented by only weak lateral rudiments. These extremes and all degrees of variation between them may be seen in any large series even when collected in the same locality under identical conditions. Furthermore size and form seem to be in no way correlated with

any structural peculiarities; the length varies from 5 to 8 mm. and averages 6.5 mm. These facts suggest that *maritimus* is merely a variant form of *sexstriatus*.

The southern exponent, *jacobianus*, is readily distinguished by characters which are more constant and which correlate well with its distribution; however they are not sufficiently strong or clearly defined in specimens from its northern limit of range to warrant its status as a distinct species; it seems preferable to consider it as a subspecies of *sexstriatus*. This subspecies is characterized by its strongly impressed transverse frontal stria and by its less definite third dorsal elytral stria. The latter varies, being strong and entire as in *sexstriatus* in some individuals, or almost obsolete except for a fine rudiment in the basal third in others; this latter condition seems to be the most typical in spite of the fact that the form was described from an example having the third dorsal strong and entire. In all other respects including size variation this subspecies resembles *sexstriatus*. It is distributed from the southern San Joaquin Valley in the north, south along the coast and in the mountains to San Diego. I have also seen specimens from south central Arizona which are identical with the California material and which constitute a new record of distributon for the group.

The author wishes to express thanks to Mr. E. P. Van Duzee for permitting use of material in the collection of the California Academy of Sciences, to Dr. E. C. Van Dyke for loan of material from his collecion as well as for reading the manuscript and to Mr. H. B. Leech for helpful criticisms and suggestions.

Collecting Bees From Cactus Flowers

In collecting bees from cactus flowers the use of a net is distinctly limited. Females of several species may be readily captured by merely placing the mouth of a collecting vial over the flowers from which they are gathering pollen. Males, however, do not always visit the flowers, but in certain species fly rapidly about the plant in constant search for females. This particularly applies in the case of *Diadasia*. These latter may be collected by placing a dead female in the center of a conspicuous flower. The male bees locate the female (apparently by sight) and alight upon the flower, remaining long enough to be easily captured.—E. Gorton Linsley.

NOTES ON THE MIGRATIONAL FLIGHTS OF VANESSA CARDUI[1] IN UTAH

BY DR. JOHN W. SUGDEN

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The periodic migrational or dispersional flights of the Painted Lady butterfly, *Vanessa cardui*, have been described and occasionally they have been so noticeable as to have excited comment in the daily press. The following Salt Lake City and Utah flights have been noted.

1924. The butterflies appeared in large numbers on April 13th and were flying in a northerly direction. They were common in all parts of the city, were seen in the downtown section and the flight continued most of the day. They were most numerous the first day at which time many were flying in pairs but for the remainder of the week only single individuals were on the wing. The insects were lighter in color than the usual mid-summer individuals and all were in good condition. With a hand net specimens were easily collected without moving from one spot as fast as it was possible to remove them from the net.

1930. Starting March 30th and continuing for several days the butterflies were seen fairly evenly distributed over the entire city including the downtown district. Three or four to six or eight could be seen in a city block while traveling in a car. After April 10th none were seen in flight.

1931. On May 3rd many light-colored insects were found all over the city and all were flying in a northerly direction. None were mating or hovering about. They were flying in a steady manner from three to twenty feet above the ground in a direct course deviating only to pass obstacles. During the last week of April a similar but larger flight took place but apparently it was much more extensive as it was noticed in other parts of the state.

1935. On May 7th and 8th very large flights were found from Richfield, Utah (Sevier County) north to the point of the mountain at the junction of Salt Lake and Utah counties, a distance of about 100 miles and a smaller flight was observed over Salt Lake City. The insects were flying north in the usual

[1] Pyrameis cardui (L)
Cynthia cardui (L) Barnes and Benjamin, 1926
Vanessa cardui (L) Comstock, 1927

steady manner. About the gardens a few individuals (the residents) were flitting about the flowers. In Richfield there was at the same time a flight of *Pieris rapæ*.

These flights were all of light-colored individuals, flying in a northerly direction on the early warm days of spring. The 1924 flight apparently was very extensive as it has been reported as having been observed from the coast of Southern California as far east as Southern Colorado.

Personal Notes

Certain members of the Pacific Coast Entomological Society are now, or have been, in the field this season for collecting or for scientific research. Dr. Van Dyke spent a part of May and June in Owen's Valley, California, in charge of The University of California's summer class 99 in Entomology, making their headquarters at Lone Pine, Inyo Co. Judging from the fine series of insects he has turned over to the Academy he must have greatly depleted the insect fauna of the Valley. From this region the Academy has had little except the rather extensive series of Hymenoptera and diurnal Lepidoptera taken there by the late Chas. L. Fox, and something over 8,000 insects, mostly Coleoptera and Hemiptera taken by R. L. Usinger and the writer in 1929.

During May the writer collected on the Mojave Desert, working out from Palmdale into Mint Canyon and the Antelope Valley to the west and to Little Rock to the east, with one week's work at Blythe where, however, conditions were too dry and hot for good results. At this writing (July 30) Dr. Van Dyke is working in Northern California and Dr. F. E. Blaisdell at Twain-Harte Lodge, or near there.

Three of the University boys, Mr. E. Gorton Linsley, Mr. Robert Usinger and Mr. Chas. D. Michener, are spending a month in the east visiting some of the more important collections of insects, studying certain groups in which they are interested and comparing specimens with some of the types there. They drove east by auto, visiting collections in Colorado, Kansas, Iowa, Washington, Philadelphia, New York and Boston. They expect to be back in early August.—E. P. Van Duzee.

THREE NEW BEETLES OF THE GENUS CRYPTOCEPHALUS (CHRYSOMELIDÆ)

BY B. E. WHITE

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Extensive study of the genus *Cryptocephalus* has proven the existence of three new members. These are presented as a forerunner to a revision that will include the American species from north of Mexico.

Cryptocephalus cerinus White, new species

Wax yellow, large, robust, especially proportionally broader at base of elytra, the third and fifth elytral intervals conspicuously wider, punctures on the elytral disk separated by at least their own diameters.

Female: Head pale, interocular impression and around antennal insertion slightly darker, surface smooth, sparsely punctured, antennæ reaching to first abdominal segment, outer segments darker; thorax two-thirds as long as wide, sides gradually narrowing toward apex then more arcuate to apical angles, hind angles directed backward, surface nearly impunctate, pale brown or slightly fuscous, with a pale yellow crescent-shaped area extending across the base, the tips directed forward, a smaller pale triangular area at the apical margin with the inner angle prolonged up the disk mid-way from the apex; elytra wax yellow with rows of brown punctures, scutellar stria short reaching basal third, first stria extending to middle, the second united at apex with the seventh, the third united at apex with the fourth, the fifth united at apex with the sixth, seventh united at the humeral angle with the marginal stria, all striæ entire except sixth which is confused at humeral third, intervals feebly convex, shining and very feebly wrinkled, intervals wide; body beneath and femora pale; prosternum very broad and only feebly convex with the anterior cusp quite blunt and the posterior lateral prominence directed backwards; last ventral segment with a deep, round fovea. Length 6 mm., width 3.25 mm.

Male: Similar to female but smaller as usual, the anterior cusp of the prosternum much more pronounced and acute while the posterior prominences are more widely separated than in the female, only an inconspicuous indication of the fovea on the last ventral segment. Length 4.5 mm., width 2.5 mm.

Type locality: Lebec, California.

Host: *Chrysothamnus nauseous* subsp. *mohavensis* Hall.

Holotype female, allotype male, and nineteen paratypes collected by author are in his collection, two paratypes in collection of the California Academy of Sciences, two in A. R. Mead's collection, one in each of the following collections: A. T. McClay and M. A. Cazier, three in R. F. Peter's collection, two in the H. B. Leech collection and ten in the Roy S. Wagner collection.

The larger size, more robust form, arrangement of the elytral striæ and punctures and the distinct difference of the prosternum will easily separate this species from *C. spurcus* Lec., which seems to be its nearest relative. *C. spurcus* is consistently found on *Isocoma* while *C. cerinus* seems restricted to *Chrysothamnus*.

Cryptocephalus spurcus vandykei White, new subspecies

Fuscous with three black vittæ on each elytron confused, black markings on the pronotum, medium to large size, form robust, punctures heavy and close together.

Female: Head pale, a narrow inter-orbital impression and the area around the antennal insertion darker, surface moderately punctate with a single hair arising from each puncture, antennæ reaching to basal third of elytra, uniformly dark; thorax twice as broad as long, feebly arcuate at sides, more strongly arcuate near apical angles, hind angles directed backward, color fuscous with lateral basal spots, a median triangular basal spot and two large lateral discal spots darker, the discal spots gradually fading laterally and then fusing with the lateral basal spots, surface moderately finely punctate, the punctation more dense and coarse in the darker areas; elytra fuscous, minutely rugose with rows of coarse black punctures, scutellar stria short, not reaching base, first stria reaching to apical third, second nearly joining the submarginal at apex, the third and fourth united at apex, fifth and sixth united at apex, submarginal united at base with the marginal; punctures very close, nearly confluent in the striæ; area between scutellar stria and suture black, interval between scutellar and first stria fuscous, third interval black, fourth fuscous from apex to basal fourth where it becomes black, fifth entirely black, sixth fuscous from base to apical fifth where it is black, seventh black from base to middle where it becomes fuscous, eighth fuscous from apical tip to humeral umbone which is black, marginal vitta black from apex to middle, fuscous from middle to base; body beneath piceous, paler at middle and sides; prosternum similar to that of *C. spurcus* Lec. but a little more convex and the posterior prominences more approximate; last ventral segment with a large deep fovea at the middle; pygidium dark and heavily punctate. Length 5.25 mm., width 3 mm.

Male: Similar to female but smaller and without the fovea on the last ventral segment. Length 4.25 mm., width 2.25 mm.

Type locality: Carpinteria, California.

Host: *Isocoma venetus* subsp. *vernoniodes* Jepson.

Holotype female, allotype male, with twenty-five paratypes collected by the author are in his collection: several paratypes in collection of the California Academy of Sciences and two in each of the following collections: A. T. McClay, A. R. Mead, M. A. Cazier.

There seems to be very little variation in this subspecies other than in degree of color and that is not pronounced. The punctures on the elytral disk are quite constant and the color pattern is very similar in the 75 or 100 specimens examined. The size ranges from 4 to 6 mm. in length. This form has been included in collections with the typical *spurcus* which differs from it by being lighter and having the lighter areas dirty yellow where *vandykei* is fuscous. The markings on the prothorax and the elytral vittæ are dissimilar. I take pleasure in naming this distinct geographical subspecies after Dr. E. C. Van Dyke.

Cryptocephalus cerinus nevadensis White, new subspecies

Wax yellow, large, robust, especially proportionally broader at base of elytra, the third and fifth elytral intervals conspicuously wider, punctures on the elytral disk separated by at least their own diameters, three well defined black vittæ on each elytron occupying the second, fourth, and sixth intervals.

Female: Head pale, interocular impression and around antennal insertion slightly darker, sparsely, finely punctured and pubescent, antennæ reaching to first abdominal segment, outer segments darker; thorax two-thirds as long as wide, sides gradually narrowing toward apex, then more arcuate to apical angles; hind angles directed backward; surface shining nearly impunctate, pale with the discal and lateral basal spots fuscous; elytra straw-yellow with three well defined vittæ occupying the second, fourth, and sixth elytral intervals, scutellar stria short composed of nine to twelve punctures and extending to basal third, first stria reaching apical third where it nearly joins the second; second extending to apex where it meets the submarginal, third and fourth joined at apex as are the fifth and sixth, the sixth slightly confused behind humeral umbone; submarginal joining the marginal stria at the humeral angle, all striæ regular with exception of

sixth, intervals very feebly convex and feebly wrinkled; body beneath and legs pale with occasional sclerites darker, last ventral segment with a deep longitudinal fovea. Length 6.25 mm., width 3.3 mm. Male: Similar to female but smaller and with the anterior cusp of the prosternum much more pronounced. Length 5 mm., width 2.5 mm.

Type locality: Carson Valley, Nevada.

Host: *Chrysothamnus?*

Holotype female (No. 4534), allotype male (No. 4535), in collection of the California Academy of Sciences; two paratypes in author's collection, all collected by Dr. E. C. Van Dyke.

This form is similar to *C. cerinus* but differs by having very well developed black vittæ. The prosterna of the two forms are identical. Since this form has been confused with *C. confluens* Say it is desirable to give it a subspecific standing for its geographical range is apparently distinct from that of *cerinus*.

CULTURE METHODS FOR INVERTEBRATE ANIMALS[1]

In this 8vo work of 590 pages a Committee of the American Association for the Advancement of Science has given us a most useful compendium of articles on the rearing of invertebrate animals for laboratory use and under laboratory conditions. The portion assigned to the rearing of insects fills 259 pages and is divided into 161 short articles, each written by, or abstracted from the writings of, someone who has done authoritative work in this field of entomology. It is distinctively a laboratory manual and will be of great value to anyone having occasion to raise insects for laboratory use or experimentation. Under each species treated we find a detailed account of the writer's method of raising the insect in quantity under laboratory conditions.

This compendium will be found of equal value to any one interested in life history work on our insects as it will give him the results of carefully worked-out methods on the same or related species. No one interested in the breeding of our insects can afford to miss the results of others' work as given in this book.—E. P. Van Duzee.

[1] Culture Methods on Invertebrate Animals. By a Committee from Sec.F of the American Association for the Advancement of Science. Comstock Publishing Co., Inc. Ithaca, N. Y., 1937. Price $4.00.

FOUR NEW CALIFORNIA COLEOPTERA

(Buprestidæ, Scarabaeidæ, and Cicindelidæ

BY MONT A. CAZIER

University of California

Extensive work in the groups enumerated above has disclosed a number of new additions to the Coleoptera fauna of California. These are here presented as forerunners of more monographic works in each group.

Acmæodera rossi Cazier, new species

Small, robust, flattened; cupreous black, disk of elytra with a wide yellow band extending from base, narrowing to apical sixth, a yellow arm extending around umbone to base, and a small spot isolated at apical third; margin black with cupreous lustre, often with faint yellow spots along discal edge; squamose on both dorsal and ventral surfaces; general shape as in *A. insignis* Horn. Head with front cribrate, densely clothed with elongate squamæ; antennæ with fourth segment abruptly wider than third, fifth slightly wider than fourth; clypeus emarginate. Pronotum unicolorous, cribrate, sides and base of disk densely squamose, anterior portion covered with elongate squamiform hairs; sides visible only at base, not wider than elytra, base with deep pit on either side. Elytral margin sinuate, each elytron individually rounded and serrate to middle or union of elytra, apices gradually narrowed, humeral umbone feebly prominent; surface striate, striæ with moderately coarse punctures, intervals slightly convex, each with a single row of setigerous punctures. Prosternum truncate in front. Beneath densely squamose, last ventral segment with single apical border. Length 4.5 mm.; width 2 mm.

Holotype in author's collection. Type locality Holtville, Cal. It is a unique female collected June 27, 1936, by E. S. Ross, after whom the species is gratefully named.

This species is closely allied to *A. insignis* Horn from which it differs by having the dorsal surface squamose, of a cupreous black color, and by having elytral margins serrate to middle of inner elytral margin. It can readily be distinguished by the densely squamose front and pronotum. Unfortunately no host record is available on this species. As far as I know, *A. insignis* is known only by the type and two or three additional specimens, all of which came from Lower California.

Phobetus saylori Cazier, new species

Small, narrow; head and pronotum black, elytral margins black, disk piceous, beneath black covered with long white pile. Head confluently punctured; terminal segment of palpi not greatly enlarged or grooved, dorsal portion flattened; antennæ nine-segmented, club as long as, or longer than, funicle. Pronotum sparsely, evenly punctate, punctures at apex of disk larger; apical and basal margins sparsely clothed with long white pile. Elytra widest at middle, base sparsely clothed with long white pile, sutural striæ evident, disk glabrous. Sternum black, thorax densely clothed and abdomen sparsely with long white pile, anterior tarsi longer than posterior, middle tarsi one-third shorter than posterior. Ædeagus of the *comatus* type. Length 11.5 mm.; width 7 mm.

Holotype male in author's collection. Type locality, Little Rock, Los Angeles Co., California, April, 1930. I take great pleasure in naming this distinct species in honor of L. W. Saylor who presented the unique type specimen to me and loaned other material to aid in this study.

This species is remarkably distinct from anything yet described in this genus. The more important features are its small size, black color with elytral disks piceous, long white pile and differential length of the tarsi. All other species in the genus have the tarsi equal or with anterior pair slightly longer. I have not hesitated in describing this species from a unique because I am aware that there are other specimens in other collections. *P. palpalis* Saylor, the only other black species known, is completely black, larger, with terminal segments of palpi greatly enlarged and grooved, the pronotum is smooth and without pile.

Cicindela californica mojavi Cazier, new subspecies

Size, shape and sculpturing as in *C. prætextata* Lec.; markings consisting of a slight indentation indicating the inner tip of middle band, all lunules broadly united, pigmented area confined to discal area along suture, ending abruptly at apical fourth; color dull cupreous-green. Head and pronotum granulate-striate, pigmented area of elytra densely punctate; beneath densely clothed with decumbent hair. Length 11-14 mm.

Holotype male, allotype female and eight paratypes in author's collection, two paratypes in the collection of the California Academy of Sciences and seven paratypes in the collection of A. T. McClay. Type localities, Saltdale and Mojave,

Cal., June 19, 1932. Collected by A. T. McClay and K. D. Sloop who very kindly turned the specimens over to me for study.

This subspecies is distinguished from the middle western *C. circumpicta* Laf. by its granulate-striate head and pronotum and the elytral markings. *C. circumpicta* is striate on head with pronotum almost smooth, and markings joined on margin but the lunules are distinct. From *prætextata* it differs in the type of markings, color and distribution.

In *prætextata* the markings are again well defined and the color is dull cupreous-brown. The distribution is confined to Arizona, New Mexico, Mexico, Utah and California. As far as I know, the only localities from California are along the Colorado River, and in Utah it occurs at St. George. Both of these localities are different ecologically and are separated by a number of miles from the type locality of *mojavi*.

The series of *mojavi* before me presents a variety of colors being cupreous-brown, cupreous-green, green, and blue. This is identical with the variations existing in *C. circumpicta*, which in one specimen also has the reduced markings as in *mojavi*. In my opinion this variation is a good subspecies because of its localized distribution, its reduced markings and variable color, as distinct from the closely related *prætextata* and *californica*. In color it parallels the variations existing in *circumpicta* but is structually distinct from that species. It occurs about the salt lakes in the Mojave desert, along with *C. nevadica*.

C. californica, which is the species over *prætextata*, is the most fully marked species in this complex and is dark green in color. It has been recorded from Mexico, Texas, and California and can readily be distinguished by having the pigmented area connected to the margin anterior to the apical lunule.

Cicindela pusilla wagneri Cazier, new variety

Size, shape and markings as in *lunalonga* from which it differs by having the head and prothorax brilliant greenish-blue, elytra dark blue. Head and prothorax as in *lunalonga*; elytra more granulate than in that subspecies, these finely granulate areas black. Beneath as in *lunalonga*. Length 10-11 mm.

Holotype female in the author's collection, allotype male and one paratype in the collection of Roy Wagner. Type locality, Friant, Fresno Co., Cal., May 21, 1920.

This variation occurs in pure stock at the type locality which is quite different from the habitat of *lunalonga*. It was taken along the banks of the San Joaquin River at Friant which is located in the dry foothills of the Sierra. The habitat of *lunalonga* is at higher elevations where it occurs along shady paths, streams, and in the meadows.

I take great pleasure in naming this variety in honor of Roy Wagner who presented the specimens to me for study. It represents a relatively stable color variation of *lunalonga* which is a subspecies of *C. pusilla* Say.

I would like to acknowledge the assistance given by Dr. E. C. Van Dyke and the generous loan of specimens from the following: E. P. Van Duzee, John H. Robinson, Roy Wagner, K. D. Sloop, A. T. McClay, L. W. Saylor and E. S. Ross.

A NEW EPINOTIA FROM CALIFORNIA

(Lepidoptera-Olethreutidæ)

BY W. HARRY LANGE, JR.

University of California

Epinotia keiferana Lange, n. sp.

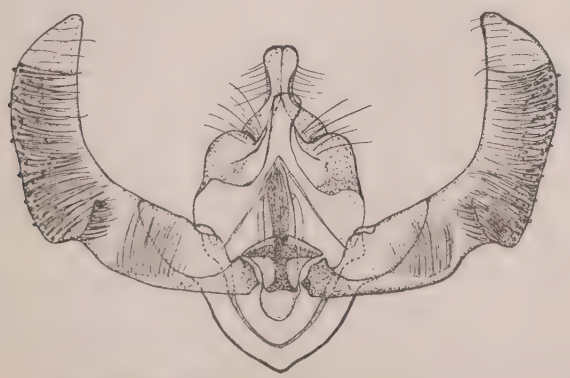
Expanse 17-18 mm. Palpi long, with first joint silvery white, outwardly ferruginous, tipped with grayish scales; second and third joints ferruginous with grayish scales. Head and thorax ferruginous with scales tipped with grayish. Patagiæ same color as thorax with few grayish scales along inner edge. Antennæ with scape grayish; flagellum yellowish above with black tufts projecting from joints and clothed with light colored hairs; underneath yellowish. Forewing unicolorous; background ferruginous, heavily irrorated with grayish scales, especially beyond discal cell; a distinct cupreous sheen; outer costal margin with cupreous tint and with an indefinite longitudinal area following median vein to outer margin of same color; cilia with dark ferruginous scales, tipped with gray. Hind wings white with distinct fuscous mottling; base of cilia fuscous, rest white with faint indication of sub-terminal fuscous band. Underside of forewings fuscous, irrorated along costal margin; outer margin, and inner margin with gray; underside hind wings white with fuscous mottling. Abdomen grayish. Legs grayish with fuscous scaling; pro- and mesothoracic legs outwardly with more fuscous scaling; tarsi with indication of single grayish annulus on each segment. Male genitalia with harpes broad and costal margin directed inwardly with

blunt apex; cucullus set with well developed spines. Uncus simple, spoon-shaped from beneath with apex bifid.

Holotype, male, collected by Mr. H. H. Keifer at San Francisco, April 14, 1932, as larva, on *Salix lasiolepis* Bentham, the adult emerging January 6, 1933. Allotype female with same data, the adult emerging January 10, 1933. Two male paratypes and one female paratype with the same data, the adults emerging January 5, 6, and 14, respectively.

This species runs in Heinrich's Key[1] to Group B, without a costal fold, and in the unicolorous section close to *arctostaphylana* (Kearf.) The costal fold although absent, is indicated by an upturning of the costa for a considerable distance. A variation in the intensity of the reddish-brown background of this species is indicated, and in the irroration of grayish scaling. The allotype shows a much deeper reddish-brown color for the forewings, palpi, patagiæ and thorax, the antennæ lack the long clothing of hairs of the holotype and the distinct yellowish color is changed to a grayish tint. The male genitalia is distinct, with a camera lucida drawing of the holotype being figured. The forewing in one paratype indicates a darker transverse line beyond the discal cell.

The species is named for the collector, Mr. H. H. Keifer. Types deposited in the California Academy of Sciences, San Francisco (No. 4536, C.A.S., Ent.). Paratypes to be returned to H. H. Keifer.



Male genitalia of *Epinotia keiferana* Lange

[1] Heinrich. 1923. U. S. Nat. Mus., Bull. 123, p. 196.

Supplemental Notes on a Cicadellid

BY E. P. VAN DUZEE

Ehromenellus oregonensis Baker

Recently Dr. E. C. Van Dyke has taken eight specimens of this interesting cicadellid, one at Hood River, Oregon, in June, the others at Longmire in the Rainier National Park, Washington, in July. As Baker's description is insufficeint for certain determination of this species I give here a supplemental description that should help. The subconical head, the two polished black points at base of the vertex and the distinct genitalic characters will readily distinguish this species.

A little shorter than *uhleri* with a more produced and convex head and distinct genital characters, the males with abbreviated elytra as in the females. Length 5-6.5 mm.

Male: Head obtusely conical with the apex broadly rounded, nearly one-half as long as broad across the eyes (15:35); vertex feebly convex, depressed about the ocelli and against the eyes; front distinctly longer than its basal width (25-18), a little more convex than in *uhleri*. Pronotum proportionately longer, as 14 to 32, in *uhleri* as 15 to 38; before and behind the callosities more strongly striate than in *uhleri*. Scutellum more strongly striate, with two transverse fovæ; base covered by the pronotum nearly to the fovæ as in brachypterous *uhleri*. Elytra nearly attaining apex of abdomen; costa broadly rounded; veins strongly elevated; basal areole shorter than in female *uhleri*. Last ventral segment feebly emarginate; plates polished, shorter and flatter than in *uhleri*, attaining apex of abdomen, with very few short hairs.

Color fulvo-testaceous varied with brown; base of vertex with a pair of polished round black spots; front blackish with pale lineations; sides of pronotum and region of callosities with black marks and vermiculations; basal angles of scutellum dusky, the fovæ black; veins whitish varied with brown as are the areoles; base of clavus with a blackish cloud. Abdomen black, apex and a few points on tergum pale. Legs pale, lineate with brown.

Female about as in male, a little larger, the elytra usually showing a distinct oblique pale vitta near the base. Last ventral segment truncate with a feeble emargination; colors paler, especially on the abdomen, which is pale pointed with black.

THE GENUS DACTULIOTHRIPS MOULTON

BY STANLEY F. BAILEY

University of California

The family Dactuliothripidæ was erected by Moulton for his *Dactuliothrips spinosus* in 1931 in this journal (Vol. 7: 173-174). Two new species in this genus have recently come to hand from southern California extending the distribution of this group of thrips some 450 miles south and still limiting the genus to California.

In addition to the generic characters well set out by Moulton, another, common to all three species, is to be noted, namely: the presence of spurs on the inner anterior margin of the fore femora.

This genus is most closely related to *Ankothrips* Crawford and *Melanthrips* Haliday since the maxillary palpi are three-segmented (fig. 6) and the labial palpi are two-segmented (fig. 5) in the three genera. The three genera may be separated by the following key:

Second antennal segment produced apically in the form of a tooth. Vertex produced anteriorly. Sensory areas at tip of antennal segments 3 and 4 in the form of a band or ring extending partly or almost entirely around the segments and at right angles to the longitudinal axis of the segments .....*Ankothrips* Crawford, 1909

Second antennal segment normal; not produced.

Fore tibiæ with a strong tooth at the tip. Fore tarsi without claws. Sensory areas on antennal segments 3 and 4 take the form of an oblique line or ring near the tip of the segments partly or almost entirely circling them. Annulations on antennal segments very weak.....*Melanthrips* Haliday, 1836

Fore tibiæ without teeth. Fore tarsi with a well-developed claw. Sensory areas on antennal segments 3 and 4 are represented by two circular to oval areas on each segment. Annulations on antennal segments strongly developed.....*Dactuliothrips* Moulton, 1931

A key to the species of *Dactuliothrips* based on those characters observed to be constant in a long series follows.

KEY TO THE SPECIES OF DACTULIOTHRIPS MOULTON

Spurs on inner margin of fore femora weak, one to four in number, usually one or two (fig. 11). Head clearly wider than long.

1. Claw on fore tarsus (fig. 14) simple or with a very weak tooth near base. Spines on body fewer in number and less dense than in other two species. Third and basal three-fourths of 4th antennal segment yellow, remainder of segments brown ..... *D. xerophilus* Bailey

Spurs on inner margin of fore femora strongly developed, 2 to 9 in number. Head about as wide as long.

1. Claw on fore tarsus simple and knobbed (fig. 10). Spines on body very dense and strongly developed. Antennæ uniformly blackish-brown. Outer post-ocular bristles 91-97 microns; spurs on fore femora 4-9..... *D. boharti* Bailey
2. Claw on fore tarsus notched or with small tooth below tip (fig. 13). Antennæ dark brown with 3rd segment yellow. Outer post-ocular bristles 65-78 microns. Spurs on fore femora 2-5 ..... *D. spinosus* Moulton

DACTULIOTHRIPS SPINOSUS Moulton, 1931. (Genotype)

Distribution: Willow Ranch, Siskiyou County, California. Cajon Pass, San Bernardino County, California. Valyermo, Los Angeles County, California.

Hosts: *Prunus dermissa* (choke-cherry), May 19, 1929, G. R. Struble; *Ceanothus* sp., April 12, 1936, R. M. Bohart.

Since no illustrations accompanied the original description of the genus a few of the more important characters of *spinosus* are presented with illustrations of aid in differentiating the species. All the *Dactuliothrips* specimens studied were mounted in modified Gater's medium which causes a slight swelling of the specimen but enables one to study the chætotaxy much better. Measurements of structures do not include inter-segmental membranes. Mr. Moulton has kindly compared *boharti* with the type of *spinosus*.

Dactuliothrips boharti Bailey, n. sp.

Female: Color uniformly dark brown. Fore tibiæ and tarsi lighter. Abdomen light grayish brown in newly emerged individuals. Wings uniformly grayish brown, nearly clear in basal fourth. Hind wing clear. All spines dark and very pronounced. Thorax often with slight red pigment. Antennæ uniformly dark brown to black.

Measurements of type: Total body length, 1.8 mm.; head, length, .20 mm., width, .20 mm.; prothorax, length, .14 mm., width, .31 mm.; mesothorax, width, .39 mm.; abdomen, greatest width, .45 mm. Length of antennal segments in mm.; I, .033; II, .049; III, .079; IV, .075; V, .075; VI, .077; VII, .067; VIII, .057; IX, .072,

total length, .572. Length of spines: interocellar, .084 mm.; postocular (outer), .097 mm.; (median), .058 mm.; posterior-lateral margin of prothorax, .13 mm.

Head (fig. 1) about as long as wide, cheeks slightly arched, eyes slightly protruding, sockets of antennæ projecting forward beyond eyes. Three ocelli. Head reticulate on dorsum, reticulations transverse and becoming stronger on posterior margin. Mouth cone short. Antennæ (fig. 9) slender, tapering to tip, rings or annulations present on all segments except I, faint on II. Two circular to oval sensory areas on each of segments III and IV, one smaller area on II. Rings not always constant in number or uniform.

Prothorax (fig. 4) about twice as wide as long. Spines very strongly developed. Legs liberally covered with hairs and spines. Fore femora thickened and armed with from four to nine heavy spurs on inner anterior margin. Hind tibiæ only with several well-developed spines at tip. Wings covered with very minute hairs. Fore-wing (fig. 2) broadly rounded at tip, slightly narrower at base. Usually four cross veins, two between ring vein and anterior longitudinal vein, one in center between the two longitudinal veins, and one between posterior longitudinal vein and posterior margin. Occasional specimens are seen with additional cross veins, partly or wholly developed. The number of regularly spaced bristles on the longitudinal veins vary; 13-17 on fore vein, 12-16 on hind vein. Hind wing clear, ring vein thickened near base with several slightly curved hairs and one hooked hair on anterior margin.

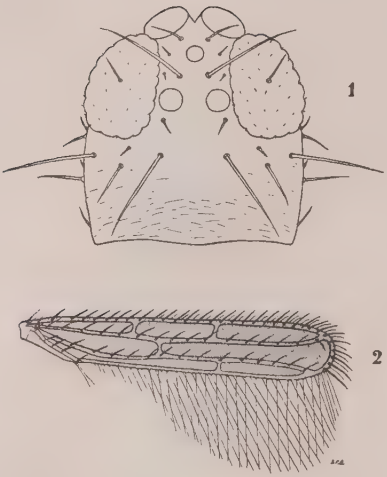
Abdomen (fig. 15) broadly ovate, tapering rather abruptly at tip. Faint transverse reticulations on dorsum of segments.

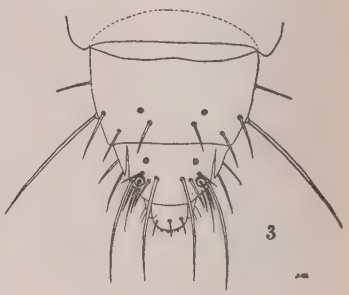
Male: Smaller than female. Tip of abdomen (fig. 3) spatulate. Total body length of male cotype, 1.5 mm.

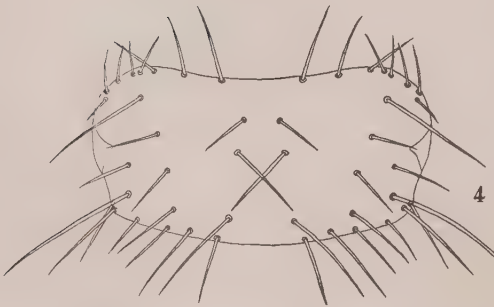
Described from a long series of specimens collected by Richard M. Bohart, an authority on Strepsiptera, after whom it is named. Collections were made April 10 and 12, 1936, at Tehachapi Pass, California, and Valyermo, California, on *Ceanothus* sp. and an undetermined host. Additional specimens were collected by him at Palm Springs, California, on March 25, 1937, on a legume. Type locality, Tehachapi Pass, California. Female type (slide T10) and male cotype (slide T11) in author's collection.

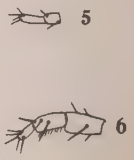
Dactuliothrips xerophilus Bailey, n. sp.

Female: Head, thorax, middle and hind legs dark brown. Fore legs yellowish brown. Antennæ with segments I and II light brown, III light yellow, IV yellow, light brown at tip, remainder





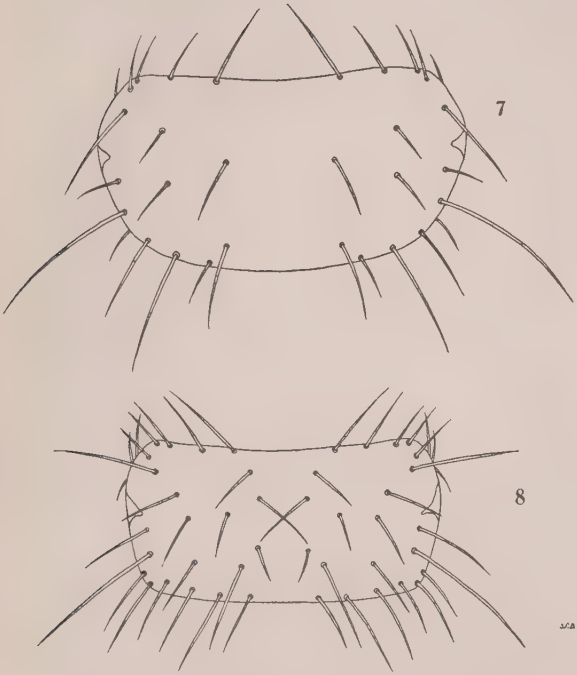




of segments uniformly brown. Wings grayish brown, often entirely clear in basal 1/3.

Measurements of type: Total body length, 2.39 mm.; head, length, .20 mm.; width, .24 mm.; prothorax, length, .16 mm.; width, .34 mm.; mesothorax, width, .84 mm.; abdomen, greatest width, .66 mm. Length of antennal segments in mm.: I, .036; II, .059; III, .075; IV, .085; V, .089; VI, .082; VII, .069; VIII, .047; IX, .052; total length .585. Length of spines: interocellar, .084 mm.; postocular (outer) .099; (median), .046; posterior-lateral margin of prothorax, .11 mm.

Head definitely wider than long, cheeks not arched as in *boharti* and *spinosus*, widest posteriorly. Three ocelli present.

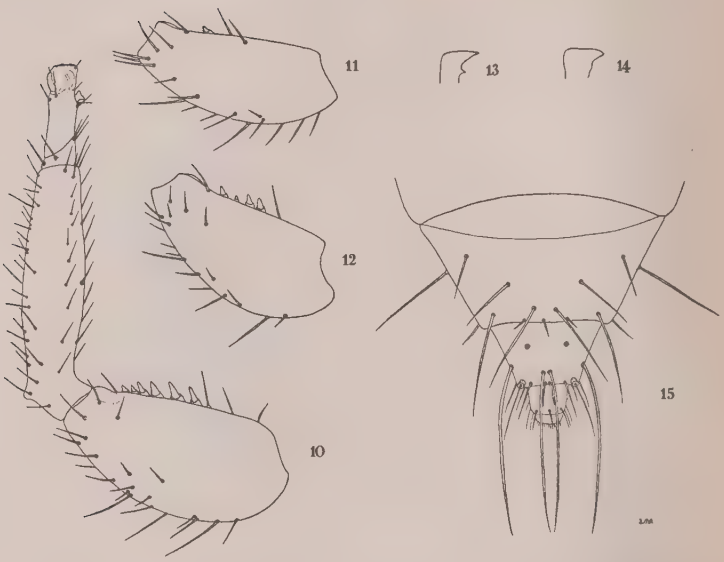


Reticulations on dorsum of head chiefly transverse and very distinct. All spines weaker than in other two species. Mouth cone short. Antennæ similar to *boharti* except coloration; sensory areas on segments III and IV somewhat smaller than *boharti*.

Prothorax (fig. 7) about twice as wide as long, spines more widely spaced and less dense than in other species (figs. 4 and 8). Reticulations distinct. Legs more slender with hairs and spurs weaker. Spurs (fig. 11) on inner anterior margin of fore femora weak and from 1 to 4 in number, usually one or two. Hind tibiæ only with well developed spines at tip. Wings covered with very minute hairs. Fore-wing similar to *boharti*, 15-20 regularly spaced bristles on the anterior longitudinal vein and 12-18 on the posterior vein. Hind wing clear.

Abdomen ovate, tapering rather sharply to the tip. Reticulations transverse and distinct.

Male: Smaller than female. Tip of abdomen similar to *boharti*. Total body length of male cotype 1.64 mm.



Described from a large series collected by R. M. Bohart in Joshua tree flowers on March 23, 1937, at Mojave and Little Rock, California. Type locality, Mojave, California. Female type (slide T12) and male cotype (slide T13) in author's collection. Additional specimens were taken by A. E. Michelbacher at Victorville, California, on April 13, 1937, from Joshua tree flowers.

List of Illustrations

1. Dorsum of head of *Dactuliothrips boharti* Bailey; 2. Right fore wing of *D. boharti* Bailey; 3. Dorsum of tip of male abdomen of *D. boharti* Bailey; 4. Dorsum of prothorax of *D. boharti* Bailey; 5. Labial palpus of *D. spinosus* Moulton; 6. Maxillary palpus of *D. spinosus* Moulton; 7. Dorsum of prothorax of *D. xerophilus* Bailey; 8. Dorsum of prothorax of *D. spinosus* Moulton; 9. Antenna of *D. boharti* Bailey; 10. Left fore leg (excluding coxa and trochanter) of *D. boharti* Bailey; 11. Fore femora of *D. xerophilus* Bailey; 12. Fore femora of *D. spinosus* Moulton; 13. Fore tarsal claw of *D. spinosus* Moulton; 14. Fore tarsal claw of *D. xerophilus* Bailey; 15. Dorsum of tip of female abdomen of *D. boharti* Bailey.

THE APHID GENUS FLABELLOMICROSIPHUM IN UTAH[1]

BY CLYDE F. SMITH[2]

Genus FLABELLOMICROSIPHUM G. & P.

Gillette and Palmer; Ann. Ent. Soc. Amer., 25: 472, 1932.

The genus *Flabellomicrosiphum* may be characterized as follows: Vertex slightly convex; frontal tubercles but slightly developed, not noticeably exceeding vertex; secondary sensoria circular; cornicles merely raised pores; cauda elongate, conical or cylindrical; anal plate rounded; hairs broadly flabellate; rostrum with terminal joint indistinct; ocular tubercles indistinct; lateral tubercles not evident; wing venation as in the genus *Aphis*.

KEY

Unguis more than 2x base; femur dark.....*knowltoni* n. sp.
Unguis less than 2x base; femur light.....*tridentatæ*

FLABELLOMICROSIPHUM TRIDENTATÆ (Wilson) [genotype]

Wilson, Trans. Am. Ent. Soc., 41: 89, 1915 (*Chaitophorus*)

Apterous vivipara. Pale green, appearing frosted due to the numerous fan-shaped hairs, 0.045 to 0.056 mm. long on the vertex and 0.034 to 0.045 on the sides of the abdomen; body 0.94 to 1.43 mm. long to base of cauda; antennæ pale, 0.47 to 0.69; antennal III, 0.086 to 0.145; IV, 0.06 to 0.094; V, 0.078 to 0.125; VI, 0.06 to 0.094 plus 0.08 to 0.157; rostrum surpassing second coxæ; rostral IV plus V, 0.08 to 0.114 mm. long and needle like; hind tibiæ 0.33 to 0.5; hind tarsi 0.08 to 0.11; cornicles slightly truncate to hardly more than raised pores without flanges; cauda 0.12 to 0.17 mm. long.

Collections: On *Artemisia*, the usual species being *tridentata*.

Utah: Beaver, August 8, 1936 (G. F. Knowlton, Smith); Beaver Dam, June 3, 1927 (Knowlton); Blue Bench, August 17, 1935 (Knowlton); Blue Creek, May 25, 1927 (Knowlton), and August 1, 1936 (Knowlton, Smith); Clover, April 30, 1936 (Knowlton); Collinston, June 3, 1937 (Knowlton); Cornish, August 9, 1927 (Knowlton); Hansel's Mountains, May 19, 1927 (Knowlton); Honeyville, July 19, 1927 (Knowlton); Howell, May 25, 1927 (Knowlton); Howell, August 1, 1936 (Knowlton, Smith); Kanab, August 10, 1936 (Knowlton, Smith); Lampo, August 1, 1936

[1] Contribution from the Entomology Department, Utah Agricultural Experiment Station.
[2] Research Assistant. Publication authorized by the Director.

(Knowlton, Smith); Manti, May 7, 1927 (Knowlton); Nephi, August 7, 1936 (Knowlton, Smith); Parowan, August 8, 1936 (Knowlton, Smith); Promontory, August 1, 1936 (Knowlton, Smith); Rattle Snake Pass, May 25, 1927 (Knowlton); Tropic, August 10 1936 (Knowlton, Smith); Thatcher, August 1, 1936 (Knowlton, Smith); Zion National Park, August 9, 1936 (Knowlton, Smith). Also collected at Yankey Jim Canyon, Idaho, June 12, 1936 (Crystle K. Smith), and at Palisades, Colorado, August 24, 1935 (Knowlton).

Flabellomicrosiphum knowltoni Smith, n. sp.

Apterous vivipara. Color dull, slaty to pinkish, overlaid with pale hairs which give it a frosted appearance; body 0.96 to 1.5 mm. long to base of cauda and bearing numerous spatulate hairs; hairs on vertex 0.04 to 0.056 mm. long; hairs on abdomen 0.026 to 0.045; antennæ slightly dusky, 0.66 to 1.12; antennal III, 0.13 to 0.25; IV, 0.08 to 0.16; V, 0.11 to 0.19; VI, 0.07 to 0.11 plus 0.25 to 0.28; rostrum attaining third coxæ; rostral IV plus V, 0.11; femora dark; hind tibiæ dusky, 0.4 to 0.68 mm. long and bearing blunt to pointed hairs 0.034 mm. long; hind tarsi 0.08 to 0.11; cornicles dusky, merely raised pores, 0.02 mm.; cauda dark, 0.11 to 0.17 mm. long for hard portion, 0.16 to 0.21 total length and bearing two to three pairs of lateral hairs and three to four dorsal or dorso-lateral hairs.

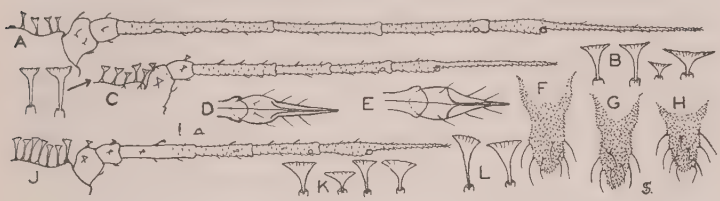
Alate vivipara. Color slightly darker than aptera; body 1.4 mm. long to base of cauda; antennæ dusky, 1.19; antennal III, 0.3 mm. long and bearing 4 sensoria; IV, 0.2; V, 0.2; VI, 0.094 plus 0.28; rostrum surpassing second coxæ; rostral IV plus V, 0.11; femora dark; hind tibiæ dusky, 0.77; hind tarsi 0.11; cornicles merely raised pores; cauda 0.125 for hard portion, 0.19 total length.

This species differs from *Flabellomicrosiphum tridentatæ* (Wilson) in being slaty colored and having dusky to black coxæ, trochanters and femora; unguis being more than 2x base; rostrum attaining third coxæ; rostral IV plus V longer than base of antennal VI; and antennæ more than one-half the length of the body.

In Utah on *Artemisia tridentata* at source of Logan City drinking water system, Logan Canyon (type locality), July 4, 1936 (alate and aptera) (Smith), July 30 and August 23, 1936 (Smith, M. W. Allen, F. C. Harmston); Brigham, August 12, 1936 (G. F. Knowlton, Smith); Cedar Valley, May 10, 1936 (Knowlton, Smith); 5 miles north of Kanab, August 10, 1936 (Knowlton, Smith); mouth of Mueller's Park, July 2, 1935 (Knowlton), and

August 12, 1936 (Knowlton, Smith); Salt Lake City, April 25, 1936 (Smith); Spring City, August 11, 1936 (Knowlton, Smith).

Type in the U. S. National Museum. Paratypes in the G. F. Knowlton collection, and in the collection of the writer.



LEGEND

Fig. 1.—*Flabellomicrosiphum knowltoni* n. sp. Alata, A, F; Aptera, B-D, G, I; B, body hairs; I, cornicle. *F. tridentatæ* (Wilson). Aptera, E, H, J-L; K, body hairs; L, hairs on vertex.

A NOTE ON GYRINID BEETLES FROM ESCUINTLA, GUATEMALA

BY F. X. WILLIAMS

The Gyrinidæ or Whiligig beetles are spectacular performers upon the surface of the water, and a company of these highly polished insects circling swiftly and in close formation upon a quiet pool, is something to look at and admire. In the well-shaded little Guachimtempeque stream a large gyrinid of the genus *Dineutes* was quite plentiful. Measuring up to nearly ¾ of an inch long, broadly oval, convex, with the outer sides of the prothorax and of the wing covers flared so as to form a sort of gunwale, gleaming like burnished metal, each individual of the flotilla moves as if propelled by a powerful motor as with rapid strokes of short, paddle-like legs that are quite invisible from above, it glides in swift and graceful curves among its fellows. Or, undisturbed, the beetles ride carefree upon placid waters, or else there is lazy motion among them but, if alarmed there is tremendous and powerful activity; lightning-like gyrations, or the company breaks up, some dashing off to another part of the pool while others dive and swim swiftly under water.

In captivity we may study their curbed activities at closer range. There are lazy or swift movements, or a lull of a few moments. We note a curved fringe of white hair bordering the front of the head at the water line and that together with the very short antennæ may serve to inform the insect when it collides with something good to eat Its vision is excellent, the compound

eyes being so divided as to enable it to see both above and beneath the water. A wounded insect dropped among the beetles may be quickly seized and devoured, a termite thus speedily disappearing, and a damselfly larva being partly consumed. When seizing prey or cleaning the fore part of the body, the relatively long forelegs, seeming perhaps to consist chiefly of elbows, are brought into play and now become visible from above. When not in use these legs are neatly folded back into a groove in the side of the thorax beneath and thus create little or no interruption in the streamline so necessary for smooth high speed.

The beetle flies well, but it crawls off the water in order to take wing.

The capacity for speed in the adult beetle is to some extent transmitted to its young that leads an underwater life and swims with considerable swiftness by (vertical) undulations of its gill-fringed body. The larva of *Dineutes* and that of *Gyrinus*, its smaller and often more abundant relative, are much alike. In addition to being larger however, *Dineutes* differs from *Gyrinus* in having the first two of the ten pairs of abdominal filaments or gills, naked, whereas in *Gyrinus* all of the ten pairs of filaments are hair-fringed or plumose. By scooping up a lot of fine debris in a foot-depth of quiet water of a large pool on which *Dineutes* was present, I netted three rather delicately made though active centipede-like larvæ of a gyrinid beetle—probably *Gyrinus*, as all ten pairs of filaments were plumose.

These lithe, slender insects had the head and thorax more or less contrastingly pallid or whitish, with the fronto-clypeal portion of the head, the eye area and the anterior portion of the strong prothoracic shield dark. The head is set on a rather narrow neck. The rest of the body is weakly chitinized, and it is closely speckled with gray, with a more or less broken dorsal and subdorsal stripe. At the caudal end of the body are four chitinous hooks. The chitinized fore part and the terminal hooks suggest a concealed existence, and indeed the larvæ spent a great part of their time more or less buried among the loose debris at the bottom of its prison. When disturbed they swam across the dish with really tremendous fish-like speed. Often one would be seen at the bottom of its prison undulating its body banner-like as though the air supply was poor. One of these larvæ moulted once and attained a length of about 15 mm., but none completed its transformations.

COLLEMBOLA FOUND UNDER THE BARK OF DEAD TREES IN CALIFORNIA, WITH DESCRIPTIONS OF TWO NEW SPECIES

BY DAVID B. SCOTT, JR.

Stanford University

Family Sminthuridæ

Sminthurus niger Lubbock, Trans. Linn. Soc. Lond., 1867. Under bark of dead Redwood (*Sequoia sempervirens*) in Big Basin, Santa Cruz Mts.; Jeffrey pine (*Pinus jeffreyi*) at Idyllwild, San Jacinto Mts.

Family Entomobryidæ

Isotoma viridis Bourlet, Memoir. Soc. Sci. Agric., Lille, Pt. 1, p. 401, 1839.
Under bark of dead Jeffrey pine (*Pinus jeffreyi*) in the San Jacinto Mts.

Isotoma aspera Bacon, "Collembola of the Claremont-Laguna Region," Pomona College Jl. of Ent. & Zool., Vol. VI, p. 49, 1914.
Under bark of dead *Quercus agrifolia* near the Calaveras Reservoir, Diablo Range.

Drepanura californica Schött, "Beitrage Zur Kentniss Kalifornischer Collembola." Bihang. Kongl. Svenska Acad. Handl., Band 17, Afd. IV, No. 8, pp. 1-24, Stockholm, 1891.
Under bark of dead alder (*Alnus rhombifolia*) in San Antonio Canyon, San Bernardino Mts.; Arroyo Seco, San Gabriel Mts.; Madrone Hot Springs, Diablo Range.

Entomobrya clitellaria Guthrie "Collembola of Minnesota," Rept. Geol. Nat. Hist. Survey of Minn., Zool. Ser. No. 4, p. 75, 1903.
Under bark of many kinds of dead trees throughout California.

Entomobrya multifasciata (Tullberg) "Fört. öfv. Sveriges Podurider." Ofv. K. Vet. Akad. Förh., 28; p. 148, 1871.
Under bark of dead oaks and various conifers throughout California.

Entomobrya sexoculata Schött var. ? Proc. Calif. Acad. Sci., 2nd Ser., Vol. 6, p. 180, 1896.

A steel blue variety taken under the bark of dead alder in the Arroyo Seco, San Gabriel Mts.

Entomobrya suzannæ Scott, n. sp.

Figs. 9-10

Color: Amber yellow with mottlings of dark blue. Head with lateral blue markings extending posteriorly from the eyes and a spot at the base of each antenna. The dorsal apices of the thoracic and first abdominal segments with blue markings, sometimes fairly even but very irregular in other instances. Fourth abdominal segment with transverse lateral bands of blue radiating from an irregular dorsal spot. Segment V with two lateral spots; segment VI unpigmented. Legs with very regular pigmentation: coxae with a compact blue spot; trochanters usually unpigmented: the fore femora slightly tinged with blue, middle and hind femora densely pigmented apically; tibio-tarsi with a well-defined wide median band of blue. Basal joint of antennæ usually slightly pigmented; second joint with diffused coloring, the third and fourth entirely blue. Furcula entirely yellow as is the ventral tube. Pronotum thickly clothed with long clavate hairs. Manubrium nearly equal to dentes in length. Crenulations on the dens end at a distance from the apex equal to three times the length of the mucro. Mucone with two teeth and a basal spine reaching to the tip of the anteapical tooth. Claws: Ungius slender with a slight incurve to the tip and a pair of lateral basal teeth; inner margin armed with a median pair of teeth and a large apical tooth. Unguilicus slender, unarmed, two-thirds as long as unguis. Tenent hair shorter than unguis. Ocelli 16. Length 2.5 mm.

Type locality, Alpine Creek, Santa Cruz, Mts.

Paratypes, Stevens Creek, Santa Cruz Mts.; Calaveras Reservoir, Diablo Range.

Taken under the bark of dead alder in very damp and cool situations. Not common. November-February. This species is close to an eastern form, *E. ligata* Folsom, but it is larger than *ligata* and has definite structural differences.

Entomobrya binoculata Schött Proc. Calif. Acad. Sci., 2nd Ser., Vol. VI, p. 178, 1896.

Taken under the bark of dead Monterey Cypress (*Cupressus macrocarpa*) on the Stanford University campus and under the bark of dead Digger pine (*Pinus sabiniana*) near Madrone Hot Springs, Diablo Range.

Tomocerus vulgaris Tullberg "Förteckning Ofver Svenska Podurider," Ofv. K. Vet. Akad. Förh., 28: pp. 143-155, 1871.
Taken under bark of dead alder (*Alnus rhombifolia*) and Douglas fir (*Pseudotsuga douglasii*) on Alpine Creek and Steven's Creek, Santa Cruz Mts.

Tomocerus flavescens Tullberg var. *arcticus* Schött "Zur Systematik Palearctischer Collembola." K. Svenska Vet.-Akad. Handl, Vol. 25, No. 11, 1894.
Taken under bark of dead alder near Madrone Hot Springs, Diablo Range.

Lepidocyrtus decemoculatus Guthrie "Collembola of Minnesota." Rept. Geol. Nat. Hist. Survey of Minn., Zool. Ser. No. 4, p. 85, 1903.
First record of this species in Californnia. Taken under bark of dead Monterey cypress (*Cupressus macrocarpa*) in Altadena, Cal.

Family Poduridæ

Xenylla helena Scott, n. sp.

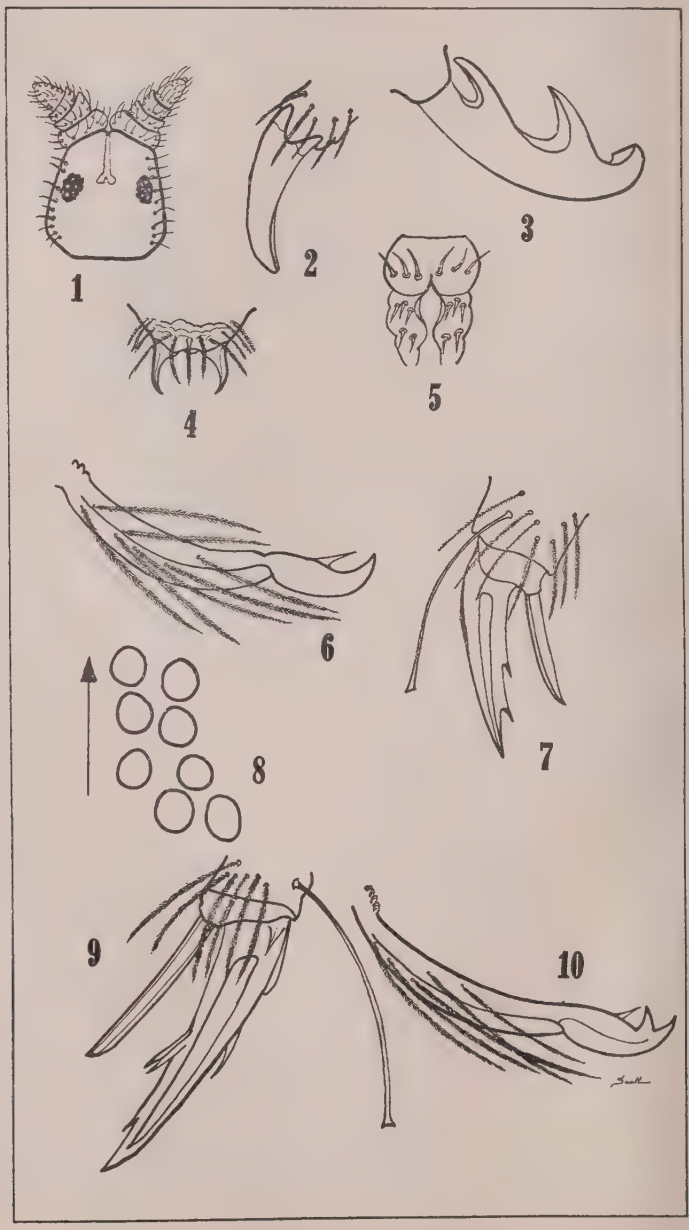
Figs. 1-5

Color: Ground color light blue with mottlings of dark olive brown. Integument granular. Antennæ four jointed, contiguous at base, each succeeding joint narrower than the last. Mouthparts in the form of a cone beneath the head. Two anal horns present on last abdominal segment. Furcula small and abortive, attached to antepenultimate segment; dentes slightly longer than manubrium. Mucrones two-thirds as long as dentes. Dentes with five dorsal spines. Mucrones with two long curved anteapical teeth and a short and blunt apical tooth. Feet with a single, stout, unarmed, blunt claw. Ocelli 10. Length 1.12 mm.

Type locality: Arroyo Seco, San Gabriel Mts. Taken under the bark of dead alder in very damp and moldy surroundings. January.

Family Aphoruridæ

Onychiurus fimetarius (Lubbock) (Lipura) Monograph of Collembola and Thysanura, p. 191, London, 1873.
Taken in very moldy and slimy conditions under bark of dead California live oak (*Quercus agrifolia*). Also taken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on the inside of a decaying acorn which was found eight inches under ground. Altadena, Cal.

Explanation of Plate

Note: All magnifications given below apply to the plate after it has been reduced one-half from the original.

Xenylla helena Scott, n. sp. Fig. 1. Head X 60; Fig. 2. Claw of left hind foot X 300; Fig. 3. Right mucro X 400; Fig. 4. Caudal horns X 150; Fig. 5. Manubrium and dentes showing arrangement of spines X 100.

Drepanura californica Schott. Fig. 6. Right mucro X 300; Fig. 7. Claw of left mid-foot X 300; Fig. 8. Left eye-spot X 100.

Entomobrya suzanne Scott n. sp. Fig. 9. Claw of right foot X 400. Fig. 10. Left mucro X 400.

NOTES ON CROSS MATING INVOLVING TROPAEA LUNA L. AND THE GENUS SAMIA

(Lepidoptera: Saturniidæ)

BY J. BRUCE DUNCAN

University of Utah

Observations in 1935 and again in the spring of 1936 revealed that when females of *Tropaea luna* were confined in a cage containing males and females of *Samia gloveri*, males of the latter seemed to show a preference for copulating with the *luna* females while the females of *gloveri* remained unmated. On the other hand there seemed to be no tendency on the part of the *luna* males to mate with females of *gloveri*, although the two were confined together during ten different attempts to induce mating. Furthermore the females of *luna* were not interested at all in the presence of the male *gloveri* and discouragd scores of attempts made by the latter to mate with them.

Male *gloveri* invariably centered their attention by preference upon *luna* females. The males began their mating activities just before dawn each morning and would either have mated or ceased all mating activities long before the sun made its appearance. When several were in the cage they would beat their wings rapidly while walking on the wire screen and would circle around and around the female. Not until one had successfully mated with her would they direct their attention to the females of their own species in the breeding cage.

Copulations occurred in May, 1935, when two *gloveri*

females, one *luna* female, and one *gloveri* male were confined to a small breeding cage, and again in early June when two *gloveri* males, one *cecropia* male, two *cecropia* females, and one *luna* female were kept together over night. In the first case, the male *gloveri* mated with the *luna* female and the two *gloveri* females remained unmated. In the second case one *gloveri* male mated with the female *luna* while all other moths in the cage remained unmated. In April and early May, 1936, the experiments were repeated and three more copulations between *luna* and *gloveri* were obtained. In all three of these matings there were females of *gloveri* present which in one instance remained unmated and in the other two instances remained unmated until the *luna* were paired with males of *gloveri*. Each one of these five cross-matings involving *luna* were of the same type (that is, male *gloveri* X female *luna*) and although several attempts were made to produce the reciprocal cross, all attempts failed. The males of *luna* were easily persuaded to mate with females of their own species, but would not mate with females of other genera.

On May 6, 1936, a female *luna* and a male *Samia cecropia* copulated. Others in the breeding cage at the time were one male *luna* and one female *cecropia*, which remained unattached. At no other time could this mating be repeated although attempts were made at least nine times to induce it.

Although six cross-matings occurred with *luna*. These involved *gloveri* in five matings and *cecropia* in one. In many other instances *gloveri* males attempted to mate with *luna*, but were discouraged from doing so by the females. Of the six successful cross-matings, four with *gloveri* and the one with *cecropia* proved to be entirely unfertile. One mating, however, involving *gloveri* and *luna*, yielded unexpected results. The mating, which has already been mentioned as the second of two occurring in 1935 between a female of *luna* and a male of *gloveri*, produced three eggs which were able to hatch. The three young larvæ were of the typical *luna* size but closer observation revealed them to be somewhat darker in color than *luna*. The larvæ were tried on a number of food plants including sandbar willow (the native food plant of *gloveri*), apple, elderberry, and poplar, but they showed no tendency to do more than

nibble once at any of these plants. Unfortunately the food plants normally eaten by *luna* were not available for this experiment.

All three larvæ died on the day following hatching and were lost through unavoidable circumstances before a more careful study could be made of them. It is impossible to say whether the small larvæ would have survived for any length of time even if they had fed upon the available food.

It is difficult to attempt any explanation as to why the members of two such widely separated species should mate so readily when confined together. It cannot be explained merely by the desire to mate, without disregarding the presence of female *gloveri* in the same cage. To all appearances there was a definite choice by the male *gloveri* for the *luna* females, although the reason for such a choice is not apparent. Further experimenting and research may serve to throw more light on this problem.

BIOLOGICAL NOTES ON TIMEMA CALIFORNICA SCUDDER

(Phasmoidea: Timemidæ)

BY LAURA M. HENRY

Stanford University, California

The genus *Timema* has but two recorded species, neither of which has been reported outside the state of California. *Timema californicum* Scudder is confined to the northern and central parts of the state. The following account of the general features of the biology of this species is not entirely complete since observations have not been carried through a full year, but it is a summary of at least the principal facts concerning its life history and habits.

The second species, *Timema chumash* Hebard, has been reported in southern California. On the basis of present records the two species do not overlap in their distribution.

Specimens of *T. californicum* have been recorded from the San Francisco Bay region, and from as far north as Humboldt County and south to Monterey and Fresno counties. All specimens have been taken from the Chaparral area. The vertical range of distribution is from 1,000 to 6,500 feet, which includes the Chaparral belts. The species has been recorded by other

authors (Essig, Ferris, Hebard) from Fir, Madrone, Deciduous Oaks, Redwood, Manzanita, Pitcher Sage, *Ceanothus*, and *Garrya elliptica*. It apparently feeds on the tender new shoots.

On May 29th, 1935, a trip was made to Loma Prieta Mountain where sixty-seven specimens were taken from *Garrya elliptica*. These were brought into the laboratory and kept alive, the tender hairs on the backs of the leaves and the new spring growth of *Garrya* serving as food. The specimens, however, died during the course of two weeks. In three cases tendencies of cannibalism were found.

A second trip was made on June 8th to Loma Prieta. Thirty-nine specimens were collected (4 immature, 18 adult males, and 17 adult females); eighteen of these were from Manzanita, the rest from *Garrya*. Manzanita proved to be the most successful food in the laboratory, the leaves and the spring bark being used. The plant material in the cages was placed in vials of water and corked with paper toweling. Any drops of excess water which the insects could reach was consumed by them. It appears from this that free water is necessary. The Chaparral regions are for the most part very dry in the summer. The source of water in the natural environment must be from dew and fog which collects on the leaves.

Habits and Life History

Records of previous studies by other authors show the earliest collecting of *Timema* as about May 18th, and that mating takes place during June and July. A trip was made to Loma Prieta on May 29th. At this time specimens were numerous, over sixty being gathered in the course of two hours. They were gathered by beating the *Garrya elliptica* or Manzanita and picking the fallen insects up from the ground. On August 1st no specimens were found in this same region.

All the females were green with a light yellow lateral line completely around the body; thorax and abdomen with an irregular pattern of green with yellow markings; appendages varying from yellow to rose brown; eyes yellow.

The males were the same green color, but the appendages were rose to brown, deepest in color at the base. Along the dorsal side of the thorax and abdomen dark green and black markings were found. The eyes were blackish. The intensity

of the coloration may vary with each specimen. Five males were found whose ventral side was yellow-green and the dorsal side yellow-brown.

Specimens have been reported which were very pink on the dorsal side and yellow-green on the ventral side.

The female insect is much larger than the male. The living adult female varied in length from 21 to 25 mm. The adult male measured 16 to 17 mm.

No information was obtained as to the number of molts that occur in the life cycle. All specimens gathered were in the last two instars. The latest date known for a specimen to molt into the adult form was June 10th, when one male molted during the night.

Mating. Some few days after the males and females reached maturity they were found pairing. The male crawled upon the back of a female. He placed the fore-legs on her meso-thorax the middle legs on the meta-thorax and the hind legs about one-third of the way down the abdomen. The female carried the male about in this manner throughout the mating and egg laying season of six to eight weeks. The male retained this position by hanging on with the tarsal claws. If a pair were forcibly separated they soon joined each other again. The adult female feeds a great deal, the male only occasionally leaves the female's back in search of food.

Copulation takes place during the early part of June. The male slides down the back of the female. The tri-lobed clasper is placed under the genitalic plate and the bi-lobed clasper at the base of the plate on the ventral side. The abdomen of the female is bent to the right and slightly upward. This position is held for several hours. Copulation takes place several times during the egg laying period and at irregular intervals. During copulation the female moves about over the plants.

Egg Laying. The first eggs usually appeared about seven days after the first copulation. In one case eggs were produced five days after the first copulation. The eggs are extruded between the valvulæ and held in the cup-like cerci. A fluid is secreted about the egg from the genitalic organs, while it is carefully turned and patted by the cerci. The egg is held by its collar with the tip of the valvulæ. The turning and coating continues for five to ten minutes; when completed the valvulæ re-

lease the egg and it is held in the cerci until the coating is dry and has hardened. When the egg is dry the female may drop it to the ground, but in the majority of cases it is carefully placed on some object. The females deposited many eggs in the folds of the paper toweling which corked the vials, others were placed in the bottom of the cages. Often the female would carry the egg about in search of a proper place to lay it.

The whole process of laying a single egg takes from 12 to 15 minutes; as soon as one egg is deposited a second may be extruded. The number of eggs laid between copulations varied a great deal. Some days only one might be laid, on others five to ten, while often no eggs were laid on a given day. As far as is known, copulation usually takes place at intervals of two to five days during the egg laying period which lasts approximately forty-five days.

Eggs. The length of the egg is 1½-2 mm. and the width is 1 mm. There is a small micropile at one end and a hard collar-like arrangement at the other. The shell is very tough and hard, but not brittle. The eggs vary in color from tan to brown, resembling the ground in which they are normally deposited. When the eggs are first laid and not completely dry they ofttimes pick up debris which helps to cover and protect them.

Timema californicum is a spring and early summer form. The insect presumably passes the late summer and winter in the egg stage and emerges sometime in the spring when the new growth of leaves is developing. Circumstances point to the fact that the span of life is short and that there is only one generation a year.

Defense. The tergite of the prothorax is shield-shaped and at each anterior-lateral angle is a darkly pigmented spot which marks the opening of an odoriferous gland. If the insect is sudddenly disturbed, a fluid is exuded from this gland. It is not entirely disagreeable but is rather strong.

Each odoriferous gland consists of a large reservoir and a gland which extends almost the entire length of the prothorax just under the hypodermal layer. The gland is pear-shaped and deeply grooved. The walls of the gland proper consist of cells with very large nuclei. The reservoir is irregular and lies between the gland and the body wall. The cells of this structure are large and have small nuclei. The gland and reservoir are

placed among the body muscles, but there are no muscles attached to them, they being held in place by the ligaments of the prothorax. The salivary gland of the same side of the body lies in close contact under the odoriferous gland.

Parasites. Two cases of parasitism were found, both involving adult females. A dead female was found with a parasitic round worm extruded from the body. In the other case an immature stage of a mite was found clinging to the thorax, apparently feeding.

PROCEEDINGS OF THE PACIFIC COAST ENTOMOLOGICAL SOCIETY

One Hundred and Thirty-sixth Meeting, June 19, 1934

Joint meeting with the Entomological Society of America, American Association of Economic Entomologists, and Lorquin Entomological Club, held at 10 a. m. in Room 113, Agriculture Hall, University of California, Berkeley, California. Members present: E. O. Essig, W. B. Herms, S. B. Freeborn, E. P. Van Duzee, F. E. Blaisdell, V. M. Tanner, R. F. Sternitsky, A. Mead, G. R. Wilson, P. C. Ting, R. E. Blackwelder, H. E. Burke, A. E. Michelbacher, J. Blum, E. G. Linsley, H. H. Keifer, R. L. Usinger, F. H. Wymore, and J. O. Martin. Visitors present as members of other societies: H. A. Scullen, E. D. Ball, R. L. Webster, H. H. Severin, W. C. Cook, J. F. Gates, R. G. Wind, P. Bailey, W. H. Nutting, L. L. Stitt, R. E. Campbell, D. H. DeLeon, W. H. Lange, A. A. Brock, H. M. Armitage, C. E. Cooley, C. F. Roseling, C. W. Woodworth, R. L. Kitchell, E. L. Wampler, J. H. Freitag, C. G. Weigle, J. E. Eckert, S. C. Dorman, J. D. Maple, R. Wall, A. C. Mason, and S. E. Flanders. Professor Essig in the chair.

Dr. Blaisdell read a paper entitled "Some Facts Regarding the Rearing of Tenebrionidæ."

His paper was followed by that of Mr. P. C. Ting, "On a Peculiar Arrangement of the Mouthparts in the Coffee Bean Weevil." Illustrated.

The third paper was read by Prof. E. D. Ball, "The Number of Generations in a season in Leaf Hoppers." Illustrated.

Mr. S. E. Flanders presented an illustrated paper on " A Correlation Between the Feeding Habits and the Development and Degeneration of Ovarian Eggs in Pteromalidæ."

Mr. Charles Woodworth read a paper entitled "The Internal Anatomy of a Wireworm," illustrated by numerous drawings.

The final paper of the program was presented by Mr. F. H. Wymore, on "Observations of the Song of the Cicadidæ."

After discussion of the above papers the meeting adjourned.—J. O. Martin, Secretary.

One Hundred and Thirty-seventh Meeting, September 1, 1934

Meeting held at 2 p. m. in the entomological laboratories of the California Academy of Sciences, San Francisco, California. Members present: E. O. Essig, E. C. Van Dyke, F. E. Blaisdell, E. G. Linsley, R. L. Usinger, J. E. Cottle, A. R. Mead, C. D. Duncan, L. W. Saylor and J. O. Martin. Visitors present: Mr. and Mrs. F. H. Parker, F. R. Platt, P. S. Parker, Wm. Hovanitz and K. D. Sloop.

After the transaction of other business, the nominating committee consisting of Dr. Blaisdell, Dr. Van Dyke and Mr. Usinger proposed the following for officers for the ensuing year: for President, E. O. Essig; for Vice President, C. D. Duncan, and for Secretary-Treasurer, E. G. Linsley. The group was unanimously elected.

Upon recommendation of the membership committee, Mr. William Hovanitz, Mr. Kenneth D. Sloop, Mr. Fred R. Platt and Mr. Frank H. Parker were elected to membership in the Society.

Professor Essig announced the appointment of a Historical Committee consisting of Mr. Van Duzee, Mr. Linsley and Mr. Usinger (Chairman) to collect and preserve entomological material of historical interest for permanent deposition in the files of the Society.

The meeting was opened for a discussion of the summer experiences of the members. At Professor Essig's invitation Dr. Van Dyke gave an account of a six weeks' Entomology Field Course at Carrville, Trinity County, followed by a visit to the Forest Experiment Station in Modoc County, then a trip north to Crater Lake, returning by way of the California Coast. He expressed the opinion that the best collecting in this region was during May and June, becoming rapidly less productive following these two months.

Mr. Fred Platt, who had been a member of Dr. Van Dyke's summer class at Carrville discussed his collecting experiences and exhibited some of the material which had been obtained by the group.

Mr. Parker reported poor collecting in Arizona due to abnormally dry weather.

Mr. Duncan exhibited fragments of scorpions and large insects which had been obtained by sweeping the floor beneath a bat roost. These fragments were remarkable in that they indicated that bats feed upon the ground. Mr. Duncan substantiated the latter assumption with an account of seeing a bat feed upon a Jerusalem cricket on the ground.

Dr. Blaisdell stated that he had done some collecting in Madera

County and exhibited drawings of the larvæ and pupæ of various Tenebrionidæ which he had been studying.

Following Dr. Blaisdell's remarks the meeting adjourned.—J. O. Martin, Secretary.

One Hundred and Thirty-eighth Meeting, December 1, 1934

Meeting held at 2 p. m. in the entomological laboratories of the California Academy of Sciences, San Francisco, California. Members present: E. O. Essig, E. C. Van Dyke, F. E. Blaisdell, J. O. Martin, H. H. Keifer, F. H. Wymore, J. E. Cottle, K. D. Sloop, R. L. Usinger, I. McCracken, A. E. Michelbacher, C. D. Duncan, A. R. Mead, E. G. Linsley, L. M. Smith, William Hovanitz, W. H. Lange, J. L. Gressitt, G. R. Wilson, P. C. Ting. Visitors present: Miss J. Mabray, A. S. Harrison, J. Freitag, J. Reitzel.

Upon recommendation of the membership committee, Miss Janet Mabray, Mr. Julius Freitag and Mr. Joseph Reitzel were elected to membership.

Dr. Van Dyke presented to the Academy, on behalf of L. W. Saylor, an early collection of California insects made by L. E. Ricksecker.

Professor Essig introduced Mr. J. E. Cottle, who addressed the Society upon "Some methods for the collection and study of the Lepidoptera." Mr. Cottle exhibited various types of nets and equipment for the capture of various types of butterflies and moths and discussed methods for the preservation of material after capture. Mr. Keifer added a few words about technique of collecting and mounting Microlepidoptera. Dr. Van Dyke mentioned the use of cellophane cages for rearing larvæ, and Mr. Harrison stated that he had found copper useful in setting chlorophyll in green larvæ.

Following Mr. Cottle's talk, Dr. Van Dyke addressed the group upon "Some famous California collecting places." Dr. Van Dyke discussed the various localties where he had encountered good collecting during his many years of field experience and remarked upon some of the rare species he had found in these areas.

Upon the conclusion of Dr. Van Dyke's paper, the meeting adjourned.—E. G. Linsley, Secretary.

One Hundred and Thirty-ninth Meeting, March 9, 1935

Meeting held at 2 p. m. in the entomological laboratories of the California Academy of Sciences, San Francisco, California. Members present: E. O. Essig, E. C. Van Dyke, Mrs. Van Dyke, I. McCracken, A. E. Michelbacher, J. B. Steinweden, J. O. Martin, J. F. Killeen, Theron Davis, G. F. Ferris, G. R. Wilson, F. R. Platt, E. H. Nast, C. D. Duncan, A. R. Mead, William Hovanitz, Janet Mabray, R. L. Usinger, J. C. Lindahl, J. L. Gressitt, W. H.

Lange, and E. G. Linsley. Visitors present: William Upholt, A. Mallis, S. Oliver, N. H. Krauss, C. Anderson, and Mrs. E. H. Behrens.

Upon the recommendation of the membership committee, Mr. John C. Lindahl and Mr. Arnold Mallis were elected to membership.

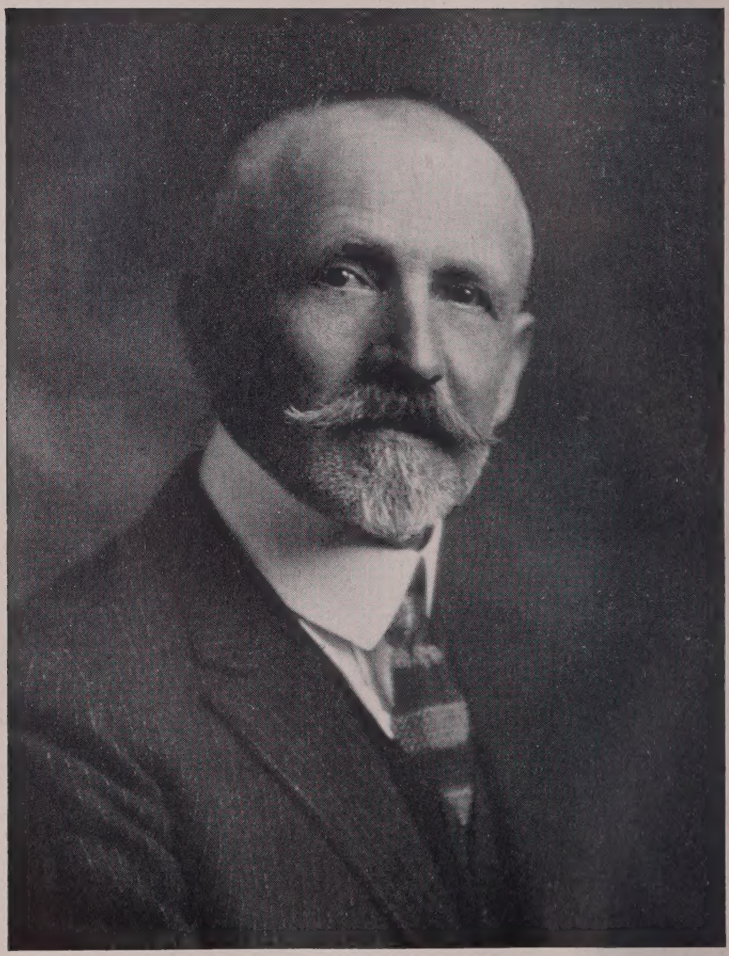
The historical committee, consisting of Messrs. Usinger, Van Duzee, and Linsley was made a permanent one, the Permanent Historical Committee of the Pacific Coast Entomological Society, and Dr. C. D. Duncan and Mr. H. L. McKenzie were added as regional members.

The President appointed Mr. Linsley and Dr. Killeen to represent the Society at the summer meetings of the Pacific Division of the American Association for the Advancement of Science to be held at the University of California at Los Angeles in June.

Mr. J. L. Gressitt, a member of the Society who has spent many years in the Orient, addressed the group upon "Some Aspects of Entomology in the Japanese Empire." He discussed the development of entomology in Japan, mentioning in particular the Imperial University, the Imperial Agricultural Stations, and the Central Research Institute in Formosa, as well as the outstanding entomologists in the region. He also pointed out the similarity between the insect fauna of Japan and that of Europe and North America and the close relationship between that of Formosa and the Himalaya region of North India. In conclusion Mr. Gressitt exhibited various periodicals and entomological books published in Japan and Formosa.—E. G. Linsley, Secretary.

The Fenyes Collection of Coleoptera

The California Academy of Sciences has recently secured the collection of Coleoptera formed by the late Dr. Adelbert Fenyes of Pasadena. It is too early now to make an estimate of the number of species or specimens in this collection but it will bring the total number of mounted insects in the Academy collection to well above one million. The Fenyes collection is strong in the family Staphylinidæ of which there are 2700 determined species. In the Aleocharinæ, in which subfamily Dr. Fenyes specialized, there are 1800 determined species. His was a world collection but, aside from the North American fauna, it is strongest in that of Europe and Mexico. As the Academy collection is comparatively weak in these faunas this Fenyes material will add a much needed element. We hope to include a biographical sketch of Dr. Fenyes in the next issue of this journal.



Dr. Adalbert Fenyes
1863 to 1937